Japanese Patent Application No. Hei 11[1999]-164215

(19) JAPANESE PATENT OFFICE (JP) (12) KOKAI TOKUHYO PATENT GAZETTE (A) (11) PATENT APPLICATION PUBLICATION NO. HEI 11[1999]-164215

(43) Publication Date:
June 18, 1999

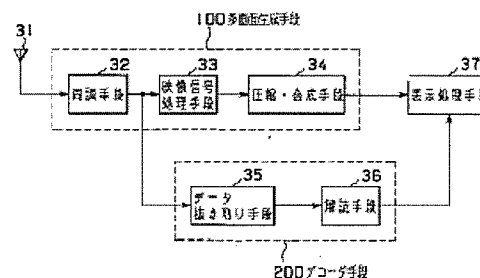| (51) Int. Cl.⁶:	Identification codes:	FI		
H 04 N 5/44		H 04 N 5/44		H
5/445			5/445	Z
5/45			5/45	
9/74			9/74	Z

(54) [Title] TELEVISION RECEIVER

(57) Abstract

Purpose

To provide a television receiver that allows program information associated with the reduced image of each channel that is displayed on a multi-picture screen to be displayed in relation to each reduced image, or, that allows only the reduced images of a particular program genre to be displayed on the multi-picture screen, so that the multi-picture screen function for program selection can be effectively utilized with greater efficiency.

100	Multi-picture generating means
200	Decoding means
32	Tuner
33	Video signal processing means
34	Compression/synthesis means
35	Data extraction means
36	Decoding means
37	Display processing means
38	Display device

Constitution

A television receiver characterized by the following facts: it allows a multi-picture display mode in which the reduced images of the programs associated with the various broadcasting stations to be displayed for program selection; in this television receiver, program-related information for each program decoded by decoding means (200) is processed by display processing means (37) so that the program-related information can be superimposed on the reduced image of each broadcasting station generated by multi-picture generating means (100) in the multi-picture display mode on display device (27); as a result, the user can view the program title, broadcasting station name, and

other information, which is unclear in the reduced
image, corresponding to the reduced image.

Claims

1. A television receiver characterized by the fact that it comprises the following means:

a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture;

a decoding means that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data;

a display device that displays the multi-picture image synthesized using said multi-picture generation means and said program-related information;

and a display processing means that superimposes the respective program-related information from said decoding means associated with the plural reduced images that are displayed on said display device on said reduced images for display.

2. A television receiver characterized by the fact that it comprises the following means:

a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture;

a decoding means that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data;

a display device that displays the multi-picture image synthesized by means of said multi-picture generation means and said program-related information from said decoding means;

a selection means that selects the prescribed reduced images from the various reduced images displayed on said display device;

and a display processing means, which displays said synthesized multi-picture image and which selects the program-related information corresponding to the reduced images selected by said selection means from said decoding means for display on said display device.

3. A television receiver characterized by the fact that it comprises the following means:

a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the

received video signal corresponding to a selected genre in the horizontal and vertical directions to display the video signals of the prescribed program genre from among the received video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture;

a decoding means that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data;

a display device that displays the multi-picture image synthesized by means of said multi-picture generation means;

a selection means that selects the reduced images of a prescribed genre according to the information that indicates the program genre;

a comparison means that compares the information that indicates program genre from the program-related information of the sequentially received channels with the program genre selected by said selection means;

and a control means that controls said compression means such that only the video signals of the channels that agree with the program genre as a result of comparison using said comparison means are compressed by said compression means.

4. A television receiver characterized by the fact that it comprises the following means:

a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the received video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture;

a decoding means that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data;

a display device that displays the multi-picture image synthesized by means of said multi-picture generation means;

a storage means that pre-stores the program-related information contained in the video signals of the prescribed channels;

a selection means that selects the prescribed program genre;

a comparison means that compares the program genre of each receivable channel from among the program-related information stored in said storage means with the program genre selected by said selection means;

and a control means that controls said tuner such that sequential and repeated tuning and reception are carried out only for the channels with the program genre that agrees with the desired genre as a result of comparison using said comparison means.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a television receiver that can display plural reduced images on a display device, and that exhibits improved convenience for program selection.

[0002]

Prior art

Known from the prior art is a television receiver that has a multi-picture display function that allows the display of video signals from plural channels as reduced images that have been compressed in the horizontal and/or vertical directions so that the user can check plural channels at the same time. In said television receiver, the images of the various channels are sequentially received, and the reduced images are arranged side-by-side for display on the display device. As a result, there is no need for the user to change the channels to check the images of the programs of the various broadcasting stations that are currently being broadcast.

[0003]

Such types of said multi-picture television receiver typically comprise the following means: a tuner that sequentially and repeatedly tune in and receive the video signals from plural broadcasting stations, a compression means that compresses the received video signals in the horizontal and vertical directions for display as reduced images, and a synthesizing means that synthesizes the compressed reduced images into a single picture.

[0004]

However, in recent years, the following type of television receiver has become popular: on a display device that has a wide assigned aspect ratio of 16:9, images with an aspect ratio of 4:3 are compressed in the horizontal direction so that they can be displayed as two images on the left and right sides.

[0005]

Also, a television receiver has been developed that can display the reduced images (search images) of the various stations on one of said two sides of a 2-picture television receiver (Japanese Kokai Patent Application No. Hei 8[1996]-223495).

[0006]

That is, the 2-picture television receiver has two tuners, a main image tuner and a secondary image tuner. The main image is shown on the left side of the screen, and the secondary image is shown on the right side of the screen. By means of the tuner corresponding to the image on the right side of the screen, the user can search the broadcasting stations input via the antenna, and the video information found by the tuner is compressed so that the reduced images are stored in a memory and displayed, e.g., as a 9-picture image. Typically, still pictures are displayed. The main image, on the other hand, is displayed on the left side of the screen, and the synchronizing signal has been removed from it since it is used for deflecting the entire picture signal that is displayed (the principal and the secondary images).

[0007]

The user views the reduced images associated with the various stations on the multi-picture screen on the secondary image side while selecting the channel to be displayed on the main image side. While the image for the selected channel is displayed on the main image side, the reduced images associated with the various stations are displayed as a multi-picture image on the secondary image side. As a result, the user can easily select the desired channel.

[0008]

As explained above, the multi-picture function can make it easier for the user to check the images of the various broadcasting stations on the screen, so that the user can easily select the desired program, which is a useful function.

[0009]

However, although it is possible to check the images of the various channels with the multi-picture function, the images are still pictures or intermittently moving strobed pictures, and it is impossible to listen to the audio associated with each image, so that it is usually difficult to evaluate the contents of the various programs.

[0010]

Also, because there is a limit to the number of reduced images that can be displayed simultaneously on the display device, it might be impossible to display all of the receivable

channels simultaneously; furthermore, it is impossible to extract only one prescribed program genre (such as news, sports, movies, etc.) for display.

[0011]

On the other hand, transmission of the information related to the broadcast programs (hereinafter to be referred to as program-related information) along with the television broadcast signal has been performed for some time. One such type of information is XDS (Extended Data Service) in the U.S. It is mainly information pertaining to the program being broadcast in the receiving channel superimposed during the vertical blanking interval of the video signal for transmission, and it contains information regarding the program title, program genre, etc. The receiver has a decoding means that receives and decodes said program-related information, and said information is decoded and displayed on the screen as the user carries out various operations.

[0012]

Another type of program-related information is EPG (Electronic Program Guide) that displays the program table on the television screen. This program-related information is inserted during the vertical blanking interval of the prescribed channel for transmission, and, in the digital satellite broadcasting and other digital transmission systems, it is digitally transmitted as EPG data packets.

[0013]

Said program-related information is displayed appropriately on the screen as requested by the user.

[0014]

However, in the aforementioned multi-picture display in said multi-picture display mode, program-related information that corresponds to the images of each channel cannot be displayed.

[0015]

Also, the user cannot set the program genre so that only programs that correspond to said genre are displayed as a multi-picture image.

[0016]

Problems to be solved by the invention

In the aforementioned television receiver of the prior art, the information pertaining to the programs of the various channels cannot be displayed in relation to the various images in multi-picture display mode.

[0017]

Also, it is impossible to set the desired program genre so that only programs of the desired genre are displayed on the multi-picture screen.

[0018]

The purpose of the present invention is to solve the aforementioned problems of the prior art by providing a television receiver that allows the program information associated with the reduced images of the various channels that are displayed in multi-picture display mode to be displayed in relation to each reduced image, or that allows only the reduced images of a particular program genre to be displayed on a multi-picture screen, restricted program genre, so that the multi-picture screen function for program selection can be effectively used with greater efficiency.

[0019]

Means to solve the problems

The first invention of the present patent application provides a television receiver characterized by the fact that it comprises the following means: a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture; a decoding means that that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data; a display device that displays the multi-picture image synthesized using said multi-picture generation means and said program-related information; and a display processing means that superimposes the respective program-related information from said decoding means associated with the plural reduced images that are displayed on said display device on said reduced images for display.

[0020]

According to the first invention, it is possible to display superimposed program-related information for each program that was decoded by the decoding means by using the display processing means. As a result, by using only the reduced images, the user can easily view the program title, broadcasting station name, and other information, so that the desired programs can be more easily selected with greater efficiency.

[0021]

The second invention of the present patent application provides a television receiver characterized by the fact that it has the following means: a multi-picture generation means that that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture; a decoding means that includes a data extraction means that extracts the data for the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data; a display device that displays the multi-picture image synthesized by means of said multi-picture generation means and said program-related information from said decoding means; a selection means that selects the prescribed reduced images from the various reduced images displayed on said display device; and a display processing means, which displays said synthesized multi-picture image and which selects the program-related information corresponding to the reduced images selected by said selection means from said decoding means for display on said display device.

[0022]

According to the second invention, by using the selection means to select a specific reduced image from the various reduced images associated with the various stations that have been generated and displayed by the multi-image generating means, it is possible to select the program information for the selected reduced image from the decoding means and to display it together with the other multi-picture images by means of the display processing means. As a result, the user can view the program title, broadcasting station name, and other information that is unclear in the reduced image, and the user can also view the detailed program information that cannot be fully displayed on the reduced image. As a result, it is easy to carry out program selection at high efficiency.

[0023]

The third invention of the present patent application provides a television receiver characterized by the fact that it comprises the following means: a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals corresponding to the selected genre in the horizontal and vertical directions to display the video signals of the prescribed program genre from among the received video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture; a decoding means that includes a data extraction means that extracts the data of the program-related information that was transmitted together with the video signals, and a decoding means that decodes the extracted data; a display device that displays the multi-picture image synthesized by means of said multi-picture generation means; a selection means that selects the reduced images of a prescribed genre according to the information that indicates the program genre; a comparison means that compares the information indicating the program genre from among the program-related information of the sequentially received channels with the program genre selected by said selection means; and a control means that controls said compression means such that only the video signals of the channels in agreement with the program genre as a result of comparison using said comparison means are compressed using said compression means.

[0024]

According to the third invention, with the selection means, the prescribed program genre can be selected, and with the comparison means, the information indicating the program genre of the received channel is compared with said selected program genre. When they agree, the control means is used to control the compression means to compress only the images of the channels that agree with the program genre to be displayed as reduced images. As a result, only the programs of the program genre desired by the user are extracted for multi-picture image display. As a result, program selection becomes more convenient.

[0025]

The fourth invention of the present patent application provides a television receiver characterized by the fact that it comprises the following means: a multi-picture generation means that includes a tuner that sequentially and repeatedly tunes in plural broadcasting stations for reception, a compression means that compresses the received video signals in the horizontal and vertical directions to display the received video signals as reduced images, and a synthesis means that synthesizes plural compressed reduced images into a single picture; a decoding means that includes a data extraction means that extracts the data for the program-related information that

was transmitted together with the video signals, and a decoding means that decodes the extracted data; a display device that displays the multi-picture image synthesized by means of said multi-picture generation means; a storage means that pre-stores the program-related information contained in the video signals of the prescribed channels; a selection means that selects the prescribed program genre; a comparison means that compares the program genre of each receivable channel from among the program-related information stored in said storage means with the program genre selected by said selection means; and a ***control means that controls said tuner such that sequential and repeated tuning and reception are carried out only for the channels with the program genre that agrees with the desired genre as a result of comparison using said comparison means.

[0026]

According to the fourth invention, with the selection means, a prescribed program genre is selected, and the program genre of the currently receivable channels from among the program-related information pre-stored in the storage means is compared with the said selected program genre using the comparison means. When they agree, the control means controls the tuner so that only the channels of the prescribed program genre are sequentially and repeatedly tuned in and received using said tuner. As a result, only the images associated with channels of the selected program genre are compressed to form reduced images for multi-picture image display. Consequently, the same effect as that of the third invention can be realized, and the pre-stored program information is used to skip the channels that are not currently being broadcast and that do not require tuning, so that unnecessary tuning of undesired channels can be avoided.

[0027]

Embodiment of the invention

In the following, embodiments of the present invention will be explained with reference to the figures. Figure 1 is a block diagram illustrating the constitution of the television receiver of the present invention. Figure 2 is a block diagram illustrating the constitution of the multi PIP processing part in Figure 1. Figure 3 is a block diagram illustrating Embodiment 1 of the process flow of the microprocessor (hereinafter referred to as microcomputer) in Figure 1. Figure 4 is a diagram illustrating the state in which the selected image and the reduced images of the selected picture are displayed as two pictures on a split screen.

[0028]

As indicated in Figure 1, for the multi-picture display television receiver, a screen with a wide aspect ratio is bisected into left and right halves for simultaneous display of the main

picture of the currently selected channel and the secondary pictures of the reduced images of the various channels in a prescribed number and configuration.

[0029]

As shown in Figure 1, the video signal received and detected by antenna (11) and first tuner/intermediate frequency amplifier-detector (hereinafter to be referred to as first tuner/IF detector) (12) is subjected to video processing, such as Y/C separation, color demodulation, etc., by means of video signal processor (13). The video signal consisting of the demodulated luminance signal and color signal are subjected to 1/2 time-axis compression in the horizontal direction by horizontal compressor (14). The horizontally compressed signal is sent to one input terminal of synthesis part (15).

[0030]

Said first tuner/IF detector (12) consists of a first tuner, which carries out tuning to the desired channel selected by means of the selection keys of operation part (24) from the television broadcasting signal received by antenna (11), and which converts the tuned television signal into an intermediate frequency (hereinafter to be referred to as IF), and an IF detector that amplifies the IF signal, followed by video detection. With the first tuner, the channel information selected with the selection keys is sent to microcomputer (22), the tuning voltage corresponding to the selected channel is sent from microcomputer (22) to the first tuner, and it is tuned to the selected channel. Said microcomputer (22) operates as the means that carries out data decoding, program genre comparison, compression control, channel tuning control, and storage. Its hardware consists of a CPU, ROM and RAM. The channel tuning data required for tuning the conventional broadcasting channels are stored in memory (ROM or RAM) in the microcomputer.

[0031]

Said video signal processor (13) consists of a Y/C separating part that separates luminance signal Y and color signal C from the signal detected by said first tuner/IF detector (12), a color demodulator that demodulates said separated color signal C, and Y delay part that delays luminance signal Y to temporally match the time delay of the color signal from the color demodulator. The luminance signal and the demodulated color signal component (I signal, Q signal) are sent to next-stage horizontal compression part (14) and one input terminal of switch part (25). To simplify the explanation, in the block diagram of Figure 1, the luminance signal and color signal are considered as the video signal, and only the video signal path is shown.

[0032]

In addition, the detected signal is sent from video signal processor (13) to synchronization separation part (16).

[0033]

Said horizontal compression part (14) consists of an A/D converter, a video memory, a D/A converter, a write clock generator and a read clock generator. From horizontal compression part (14), the video signal is compressed to 1/2 in the horizontal display period corresponding to the left half screen.

[0034]

The horizontal and vertical synchronizing signals are sent from synchronization separating part (16) to deflecting part (17). The horizontal and vertical deflection signals are sent from deflecting part (17) to display device (27). For example, said display device (27) is a cathode ray tube (CRT) with a wide aspect ratio. On the basis of said deflecting signals, display device (27) carries out horizontal and vertical scanning to display the image.

[0035]

On the other hand, by means of video signal processor (19), the video signal received and detected by second tuner/IF detector (18) is subjected to Y/C separation and color demodulation and other video processing, and it is then sent to multi-PIP (Picture-in-Picture) processor (20).

[0036]

Said second tuner/IF detector (18) consists of a second tuner, which executes search channel tuning by means of the tuning voltage from microcomputer (22) from the television broadcasting signal received by antenna (11), and which converts the tuned television signal into an IF signal, and an IF detector that amplifies the IF signal, followed by video detection. Said microcomputer (22) stores the channel tuning data required for tuning the conventional broadcast channels in its memory, and it can sequentially send to the second tuner the tuning voltages of the various stations for search channel tuning with respect to the second tuner.

[0037]

Said video signal processor (19) consists of a Y/C separation part that separates the luminance signal Y and color signal C from the signal detected by second tuner/IF detector (18), a color demodulator that demodulates the separated color signal C, and a Y delay part that delays luminance signal Y for temporally matching the time delay of the color signal from the color

demodulator. The luminance signal and the demodulated color signal components (I signal, Q signal) are sent to multi-PIP processor (20) as the next-stage compression/synthesis means.

[0038]

In said multi-PIP processor (20), the input video signals of the various stations are converted into digital signals, where the amount of data has been compressed in the horizontal and vertical directions. In addition, multi-PIP processor (20) stores the compressed signal for each station, and, after the end of storage for each station, the signal for notifying an end of write (WTEN) is sent to microcomputer (22). As microcomputer (22) receives said write end signal, it controls second tuner/IF detector (18), and the next station is received. The received video signal is compressed and stored as described above in multi-PIP processor (20), and the video signals of the various broadcasting stations are stored. The video signals stored in multi-PIP processor (20) are read at the clock frequency synchronously with the horizontal and vertical synchronizing signals from synchronization separation part (16), and are converted into analog signals, which are sent to the other input terminal of synthesis part (15).

[0039]

Here, the constitution and operation of multi-PIP processor (20) will be explained with reference to Figure 2.

[0040]

As shown in Figure 2, multi-PIP processor (20) consists of the following parts: A/D converter (201) that converts the analog signals from video signal processor (19) into digital signals; horizontal filter sub-sampling part (202) into which the A/D converted digital signal has been input, which carries out sub-sampling in the horizontal direction and limits the bandwidth; vertical filter sub-sampling part (203) that carries out sub-sampling in the vertical direction and limits the bandwidth; video memory (204), D/A converter (205) that D/A converts the digital signals from video memory (204); and input control clock generator (206) and output control clock generator (207) that control writing and reading from video memory (204). By means of said horizontal filter sub-sampling part (202) and vertical filter sub-sampling part (203), the sampling rate can be decreased, and the amount of video data can be compressed. In addition, the compressed video signal is written to and stored in video memory (204).

[0041]

Storage in video memory (204) is carried out for each station, and, after the end of storage of each station to video memory (204), a signal (WTEN) notifying an end of write from

multi-PIP processor (20) is sent to microcomputer (22). When said write end signal (WTEN) is received, said microcomputer (22) sends the tuning voltage for the next station to the second tuner. In the second tuner, the video signal of the next station is sent to IF detector and video signal processor (19), and, by means of multi-PIP processor (20), it is compressed in the horizontal and vertical directions, and, as in the aforementioned operation, the video data of the next station are stored in video memory (204). This operation is carried out repeatedly, so that the video signals of the various broadcasting stations are stored in video memory (204).

[0042]

Also, said multi-PIP processor (20) contains a counter circuit, and, after channel tuning by the second tuner is carried out reliably, the video signals are written to video memory (204). The video signals stored in video memory (204) are read at the clock frequency synchronously with the horizontal and vertical synchronizing signals and sent to synthesis part (15). From multi-PIP processor (20), for example, the reduced image signal assembled for 9 images (9 stations) is output during the horizontal display period corresponding to the right half of the display screen.

[0043]

As shown in Figure 1, synthesis part (15) alternately switches the video signal from horizontal compression part (14) and the video signal from multi-PIP processor (20) to form a synthesized 2-picture signal that is output to switching part (106).

[0044]

Said switch part (25) can switch between the 2-picture signal synthesized by synthesis part (15) and the conventional video signal from video signal processor (13). On the basis of the switching operation carried out by operation part (24), microcomputer (22) controls the switching to send either the synthesized signal or the selected conventional video signal to display processor (26).

[0045]

With respect to the video signal from switch part (25), said display processor (26) synthesizes the display signal of the program information from character generator (23), and sends the signal to display device (27). Said display device (27) can display the image with the superimposed characters of the program information.

[0046]

On the other hand, the video signals from first tuner/IF detector (12) and second tuner/IF detector (18) are sent to terminals (28-1), (28-2) of switch (28). Based on the operation of operation part (24), microcomputer (22) outputs a control so that signal switch (28) selects terminal (28-1) on the side of the first tuner/IF detector when the program-related information of the conventional picture (the conventional moving picture and not the program-selected reduced image display) is to be displayed, and it selects terminal (28-2) on the side of the second tuner/IF detector when the program-related information of the reduced images of the various stations is to be displayed.

[0047]

In data extraction part (21), the data of the program-related information superimposed on the video signal is extracted and sent to microcomputer (22). Said microcomputer (22) decodes the input data and sends the character generation control signal to character generator (23). Said character generator (23) generates the display signal for displaying the program-related information and sends the signal to display processor (26). Said display processor (26) synthesizes the video signal from switch part (25) and the video signal from character generator (23) and outputs the synthesized signal to display device (27). As a result, display device (27) can display the picture with the superimposed characters of the program information.

[0048]

Here, the digital outputs of multi-PIP processor (20) and horizontal compression part (14) are synthesized before D/A converts. After D/A conversion, the synthesized signal is output to switch part (25).

[0049]

With regard to the program-related information, in one case, the program information related to the broadcast for the channel is superimposed on the television signal of the channel. In another case, the program-related information of subsequent channels is transmitted and stored in relation to a specific channel or by means of an independent data transmission. The first case will be explained below in relation to Embodiments 1 and 2.

[0050]

In the following, with reference to Figure 3, Embodiment 1 of the process flow of microcomputer (22) will be explained for the case in which the program-related information of the reduced images of the various stations is displayed while microcomputer (22) controls switch part (25) to select the 2-picture signal from synthesis part (15) (in this case, vertical [sic; switch]

(28) is switched to terminal (28-2)). Here, Figure 3 shows the flow chart, and Figure 4 shows the screen display.

[0051]

Said microcomputer (22) controls second tuner/IF detector (18), and first tunes to the initial station (step S31). Then, while second tuner/IF detector (18) is tuned to the channel, it is determined whether the program-related information from data extraction part (21) has been input (step S32). In this case, at the same time, the video signal of the tuned channel is compressed by multi-PIP processor (20) and written to video memory (204). In step S32, if the program-related information has been input, microcomputer (22) decodes and stores the program-related information (step S33). If the program-related information has not been input, it is determined whether a prescribed time has elapsed (step S34). If the program-related information has not been input after a prescribed time has elapsed, it is determined that there is no program-related information (step S35). After the storage of the program-related information in microcomputer (22), it is determined whether the writing of the reduced images to video memory (204) of multi-PIP processor (20) has come to an end (step S36). If a write end signal (WTEN) from multi-PIP processor (20) has been input to microcomputer (22), microcomputer (22) controls second tuner/IF detector (18) to tune to the next receiving station (steps S37, S38). In this way, according to the flow of steps S32-S38, the program-related information pertaining to the broadcasting station is decoded and is stored in the RAM inside microcomputer (22) (or an external RAM). In step S37, when it is determined that channel tuning has come to an end for all of the stations, microcomputer (22) controls character generator (23) on the basis of the program-related information of the various stations that has been decoded, and the program-related information of the station is displayed at the location where the reduced image of the station is displayed (step S39).

[0052]

Figure 4 is a diagram illustrating the display state on the screen. On left picture X on the screen, under the control of microcomputer (22), the main picture data tuned by first tuner/IF detector (12) is compressed to 1/2 for display, and on right picture Y, under the control of microcomputer (22), plural (9 in the example shown in the figure) reduced images as results of search channel tuning by second tuner/IF detector (18) under control of microcomputer (22) are displayed as thumbnail pictures. For the channels preset in the memory in microcomputer (22), sequential channel tuning is carried out. In this case, the channels not set are skipped during the search channel tuning. As shown in Figure 4, on the right half of the screen, the reduced images

for the search channel tuning are displayed, and the broadcasting station name, program name, and other program-related information are superimposed on the reduced images for display.

[0053]

The control of the display of the program-related information of the reduced images of the various stations by microcomputer (22) will be explained in Embodiment 2 with reference to Figure 5. Figure 5 shows a flow chart. Figure 6 shows the screen display. Here, only the steps that are different from those of Embodiment 1 shown in Figure 3 will be explained.

[0054]

Steps S31-S38 in the flow chart of Figure 5 are the same as those of the flow chart of Figure 3. They differ from Figure 3 in that the reduced images of the various stations compressed using the method of steps S31-S38 are read from multi-PIP processor (20) and displayed as multiple pictures on the right half of the screen. In this state, a specific image from the reduced images of the various stations is selected by means of the selection keys of operation part (24). As a result, microcomputer (22) controls character generator (23), and said character generator (23) generates a display indicating the state of selection of the prescribed image, such as a frame surrounding the image or a frame surrounding the channel No. displayed on the reduced image (step S40). Said microcomputer (22) reads the program-related information of the selected reduced image from RAM, controls character generator (23), and displays the program-related information on the picture of the tuned conventional station (step S41). Then, when another reduced image from the displayed reduced images of the various stations is selected with the selection keys, in steps S40 and S41, following selected image change judgment step S42, it is displayed with a surrounding frame or a frame surrounding the displayed channel No. on the reduced image.

[0055]

The program-related information may be displayed over the reduced images on the right hand side of the screen, and its position may be adjusted corresponding to the selected image so that the selected reduced image is not hidden.

[0056]

Figure 6 shows the screen display. On the screen, left portions X has the main image tuned by first tuner/IF detector (12) under the control of microcomputer (22) displayed on left portion X, while right portion Y has the plural (9 in the example shown in the figure) reduced images searched and tuned by second tuner/IF detector (18) under control of microcomputer (22)

and displayed as secondary images. As shown in Figure 6, the search channel tuning images are displayed over the reduced images on the right half of the screen. When a particular reduced image is selected with the selection keys, the frame display (such as the frame display for channel No. 4) is carried out, with a frame surrounding the channel No. display, and the program-related information of the selected reduced image is superimposed on the tuned conventional image (the image of CH 2 in the example shown in the figure) on the left part of the main picture screen. In this case, the program-related information includes the broadcasting station name, program name, broadcasting time, genre (program genre), etc. Because the main picture displayed on the left side of the screen, the program-related information can be displayed in detail over a large portion of the screen. As explained above, the program-related information may also be displayed on the right half of the screen.

[0057]

In said Embodiments 1 and 2, it is possible to display the program information associated with the reduced image for each channel on the multi-picture display screen corresponding to each reduced image. In the following, with reference to Figures 7-9, an embodiment in which the program genre (type) is selected will be explained; only the programs that agree with the selected genre can be displayed in multi-picture display mode.

[0058]

In the following, Embodiment 3 of the process flow of microcomputer (22) when the program-related information of the reduced images of the various stations is displayed will be explained with reference to Figure 7. Figure 7 shows a flow chart, and Figure 8 shows the screen display.

[0059]

In the flow chart of Figure 7, only those steps that are different from those of Embodiment 1 shown in Figure 3 will be explained. This embodiment differs from Embodiment 1 in that step S39 is omitted, and in that steps S50 and S51 have been added.

[0060]

The user manipulates the selection keys of operation part (24) to select the prescribed program genre (type) stored in ROM or RAM of microcomputer (22), such as news, sports, movies, etc. In selecting the genre, the user presses the genre selection key on operation part (24), so that a list of the genres stored in microcomputer (22) appears on the screen via character

generator (23); the user then uses the cursor key on operation part (24) to make a selection and presses the OK key to enter his or her selection.

[0061]

First microcomputer (22) carries out the search channel tuning control to tune to the initial station (step S31). The video signal received and detected by second tuner/IF detector (18) is demodulated by video signal processor (19), and the processed signal is sent to multi-PIP processor (20), and, at the same time, the data are extracted by data extraction part (21), and the data are decoded by microcomputer (22) and stored in microcomputer (22). Here, microcomputer (22) compares the data indicating the program genre from among the decoded program-related information with the program genre previously selected by the user (step S50). When they agree, microcomputer (22) sends agreement signal (WTEN) to multi-PIP processor (20) (step S51). If, on the other hand, they do not agree, process control executes steps S37 and S38 to tune in the next station. As shown in step S36, among the sequentially input video signals, only the images of those stations that have said agreement signal (WTEN) from microcomputer (22) are compressed and stored by multi-PIP processor (20). In this way, only the programs of the genre selected by the user are extracted and displayed as reduced images in multi-picture display mode.

[0062]

Figure 8 shows the screen display. The main image tuned in with first tuner/IF detector (12) under the control of microcomputer (22) is displayed on the left portion X of the screen, and the plural reduced images corresponding to the genre previously selected with the selection keys from among the plural stations found by second tuner/IF detector (18) are displayed on the right portion Y of the screen under the control of microcomputer (22). As shown in Figure 8, for example, when the "movie" the genre is selected with the selection keys for the reduced images, only the images of the channels (CH) that broadcasts movies are displayed.

[0063]

In the following, with reference to Figure 9, Embodiment 4 of the process flow of microcomputer (22) when the program-related information of the reduced images of the various stations is displayed will be explained. Figure 9 shows the flow chart. Figure 8 shows the screen display.

[0064]

In this embodiment, the case in which a prescribed channel is used for transmission of the program-related information of the later channels and for storage in the memory in the microcomputer will be explained.

[0065]

As in the case of Embodiment 3 shown in Figure 7, the user uses the selection keys on operation part (24) to select the genre (type) of the programs stored in RAM in microcomputer (22), such as news, sports, movies, etc.

[0066]

First, the operation in which the program-related information from the prescribed channels is stored in RAM in microcomputer (22) will be explained. The data for the program-related information superimposed on the video signal of the prescribed channels received and detected by second tuner/IF detector (18) is extracted by data extraction part (21) and decoded by microcomputer (22). The data is stored in RAM in microcomputer (22) (or in an external RAM).

[0067]

In microcomputer (22), among the program-related information stored in the RAM, the data indicating the genres of the programs of the various stations are read from RAM (step S60) and compared with the data indicating the genre selected by the user, and it is determined whether they agree (step S61). If they do, the station is tuned in (step S62). If they do not, the next station is tuned in during steps S37 and S38. Only for those channels that agree, microcomputer (22) controls second tuner/IF detector (18) for sequential tuning, and said video signals are compressed by multi-PIP processor (20) and stored as shown in step S36. Only the programs of the genre selected by the user are extracted and the reduced images are displayed in multi-picture display mode.

[0068]

The screen display is shown in Figure 8 and is the same as that of Embodiment 3. The main image tuned in by first tuner/IF detector (12) under the control of microcomputer (22) is displayed on left portion X of the screen, and the plural reduced images corresponding to the genre previously selected with the selection keys from among the found plural stations during a channel search by second tuner/IF detector (18) are displayed on the right portion Y of the screen under the control of microcomputer (22). As shown in Figure 8, for example, when the "movie"

genre is selected with the selection keys for the reduced images, only the images of those channels that broadcast movies are displayed.

[0069]

     In said embodiments, as shown in Figures 4, 6 and 8, the display screen is bisected into left and right halves. On the right portion of the screen, the reduced images of the various stations found during search channel tuning are displayed in multi-picture image mode, or the reduced images of those stations that correspond to the selected program genre are displayed in multi-picture image mode. However, the present invention is not limited to this 2-picture display scheme. As shown in Figure 10, it is possible to display plural images over the entire screen of display device (27). Here, synthesis part (15) is switched to the side of multi-PIP processor (20). The read clock frequency of video memory (204) in multi-PIP processor (20) is set at half that for the 2-picture display, so that the horizontal time axis is enlarged realize a full-screen display.

[0070]

     The necessary function for the full-screen multi-picture image mode will be explained with reference to Figures 11-14 in relation to Embodiments 1-4 for the circuit of the receiver shown in Figure 1.

[0071]

     Figure 11 is a block diagram illustrating the television receiver of Embodiment 5 of the present invention. In Embodiment 5, the information (program-related information) corresponding to the programs of the various stations (that is, the various channels) is superimposed on the television broadcasting signals for the various respective broadcasting stations.

[0072]

     As shown in Figure 11, the television receiver comprises of multi-image generating means (100), decoding means (200), display processing means (37), and display device (38).

[0073]

     In addition, said multi-image generating means (100) comprises tuner (32), to which is the input television broadcasting signals of plural broadcasting stations input from antenna (31) and which sequentially and repeatedly tunes in and detects the plural television broadcasting signals; video signal processor (33), which carries out Y/C separation of the detected video signal and demodulates the luminance and color signals; and compression/synthesis means (34)

consisting of a compression means, which compresses the demodulated video signals of the various stations for display as reduced images, and a synthesis means, which synthesizes the plural compressed reduced images into a single picture.

[0074]

Said decoding means (200) consists of data extraction means (35) that extracts the data for the program-related information from the detected video signal, and decoding means (36) that decodes the extracted data.

[0075]

Said display device (38) displays the multi-picture image synthesized by multi-image generating means (100), and, on the other hand, it can also display said program-related information over the various images in multi-picture display mode.

[0076]

Display processing means (37) executes the following operation: corresponding to the various reduced images to be displayed as a multi-picture image on display device (38), the program-related information from decoding means (36) is superimposed on the reduced images, and the signal is sent to display device (38) for display.

[0077]

In Embodiment 5, the program-related information of the various stations decoded by decoding means (200) is superimposed on the corresponding reduced images generated by multi-image generating means (100) by display processing means (37), so that it can be displayed on display device (38). As a result, the user can view the program title, broadcasting station name, and other information that is unclear in the reduced images, so that the program can be selected easily and conveniently, thereby improving operating efficiency. The screen display is shown in Figure 10.

[0078]

Figure 12 is a block diagram illustrating the television receiver of Embodiment 6 of the present invention. The same symbols that were used above in Figure 11 are adopted here. In Embodiment 6, the information (program-related information) pertaining to the programs of the various stations (that is, various channels) is superimposed on the television broadcasting signals of the respective plural broadcasting stations.

[0079]

As shown in Figure 12, the television receiver consists of multi-image generating means (100), decoding means (200), display processing means (37), display device (38), and selection means (39).

[0080]

Said multi-image generating means (100) comprises tuner (32), to which is input the television broadcasting signals of plural broadcasting stations from antenna (31), and which sequentially and repeatedly tunes in and detects the plural television broadcasting signals; video signal processor (33), which carries out Y/C separation of the detected video signal and which demodulates the luminance and color signals; and compression/synthesis means (34) consisting of a compression means, which compresses the demodulated video signals of the various stations for their display as reduced images, and a synthesis means, which synthesizes the plural compressed reduced images into a single picture.

[0081]

Said decoding means (200) consists of data extraction means (35) that extracts the data for the program-related information from the detected video signal, and decoding means (36) that decodes the extracted data.

[0082]

Selection means (39) selects the prescribed reduced image from among the various reduced images displayed on display device (38).

[0083]

Said display device (38) displays the multi-picture image synthesized by multi-image generating means (100), and also displays said program-related information of the reduced image selected by selection means (39) on the screen.

[0084]

Said display processing means (37) superimposes the program-related information of the reduced image selected by selection means (39) on the reduced image as it is supplied to display device (38). Here, a scheme may be used in which, instead of superimposing the program-related information of the selected reduced image on the reduced image, display processing means (37) displays the program-related information of the selected reduced image sent to display device (38) side-by-side with the reduced image.

[0085]

     According to Embodiment 6, among the reduced images of the various stations generated and displayed by multi-image generating means (100), the prescribed reduced image is selected by selection means (39), and the program-related information pertaining to the program of the selected reduced image can be displayed on display device (38) by display processing means (37). As a result, the user can view the program title, broadcasting station name, and other information that is unclear in the reduced images and view the detailed program information that is unclearly displayed in the reduced image by selecting the desired reduced image. Only the program-related information associated the desired reduced image of the plural reduced images is displayed. Consequently, unlike Embodiment 5, in which the program-related information is superimposed on all of the reduced images for display, in the present embodiment, the unselected reduced images can be seen without character information obscuring the image.

[0086]

     Figure 13 is a block diagram illustrating the television receiver of Embodiment 7 of the present invention. In Embodiment 7, the information indicating the genre (type) of the program is pre-stored in selection means (40) or comparison means (41).

[0087]

     As shown in Figure 13, the television receiver comprises multi-image generating means (100), decoding means (200), display processing means (37), display device (38), selection means (40), comparison means (41) and control means (42).

[0088]

     Said multi-image generating means (100) comprises tuner (32), to which is input the television broadcasting signals of plural broadcasting stations from antenna (31), and which sequentially and repeatedly tunes in and detects the plural television broadcasting signals; video signal processor (33), which carries out Y/C separation of the detected video signal and which demodulates the luminance and color signals; and compression/synthesis means (34) consisting of a compression means, which compresses the video signals associated with the genre selected with selection means (40) in the horizontal and vertical directions into reduced images for output, and a synthesis means, which synthesizes the plural compressed reduced images into a single picture.

[0089]

Said decoding means (200) consists of data extraction means (35) that extracts the data of the program-related information from the detected video signal, and decoding means (36) that decodes the extracted data.

[0090]

Said display device (38) displays the multi-picture image synthesized by multi-image generating means (100).

[0091]

Said selection means (40) selects the desired genre from the data that indicate the program genre pre-stored in selection means (40) or comparison means (41).

[0092]

Said comparison means (41) compares the information from decoding means (200) that indicates the program genre of the channel sequentially received by said tuner (32) with the program genre selected by said selection means (40).

[0093]

Said control means (42) controls said compression means so that only the images of the channels associated with the program genre as a result of comparison using said comparison means (41) are compressed by the compression means in multi-image generating means (100).

[0094]

In Embodiment 7, selection means (40) selects the desired program genre, and comparison means (41) compares the information indicating the program genre of the received channel with the selected program genre, and control means (42) controls the compression means so that only the images of the channels of the associated program genre are compressed for display as reduced images in the multi-picture display mode. In this way, the user can extract and display in multi-picture display mode only the desired program genres. As a result, programs can be selected more conveniently and efficiently.

[0095]

Figure 14 is a block diagram illustrating the television receiver of Embodiment 8 of the present invention. In Embodiment 8, by means of a prescribed channel, the information

(program-related information) pertaining to the programs of the various stations (that is, the various channels) are transmitted.

[0096]

As shown in Figure 14, the television receiver comprises multi-image generating means (100), decoding means (200), display processing means (37), display device (38), selection means (40), comparison means (41), storage means (43) and control means (44).

[0097]

Said multi-image generating means (100) comprises tuner (32), to which is input the television broadcasting signals of plural broadcasting stations from antenna (31), and which sequentially and repeatedly tunes in and detects the channels of the programs that agree with the program information selected with selection means (40) among the plural television broadcasting signals under control of control means (44); video signal processor (33), which carries out Y/C separation of the detected video signal and which demodulates the luminance and color signals; and compression/synthesis means (34) consisting of a compression means, which compresses the demodulated video signals of the various stations in the horizontal and vertical directions into reduced images for output, and a synthesis means, which synthesizes the plural compressed reduced images into a single picture.

[0098]

Said decoding means (200) consists of data extraction means (35) that extracts the data of the program-related information from the video signal detected with said tuner (32), and decoding means (36) that decodes the extracted data.

[0099]

Said storage means (43) stores the program-related information from decoding means (36) contained in the images of the prescribed channels.

[0100]

Said display device (38) displays the multi-picture image synthesized by multi-image generating means (100).

[0101]

Said selection means (40) selects the prescribed program genre.

[0102]

Said comparison means (41) compares the program genre of each currently receivable channel contained in the program-related information stored in said storage means (43) with the program genre selected by said selection means (40).

[0103]

Said control means (44) controls said tuner (32) such that said tuner (32) sequentially and repeatedly tunes in and receives only the channels associated with the program genre that result from the comparison made said comparison means (41).

[0104]

In Embodiment 8, selection means (40) selects the prescribed program genre, and comparison means (41) compares the program genre of the various channels that can currently be received and contained in the program-related information stored in storage means (43) with said selected program genre, and, since tuner (32) is controlled by control means (44), only the channels that agree with the program genre are sequentially and repeatedly tuned in and received by tuner (32), so that only the images of the channels associated with the desired program genre are compressed for display as reduced images. As a result, the same effect as that of said Embodiment 7 can be realized, and, by means of the pre-stored program information, unwanted channels are skipped during tuning, so that it is possible to avoid unnecessary tuning operations.

[0105]

Effects of the invention

As explained above, according to the present invention, the program information for the images of the various channels can be displayed corresponding to each image on a multi-picture display, so that the user can view the program title, broadcasting station name, and other information that is unclear in the reduced images. As a result, program selection can be carried out more easily and conveniently, thereby improving the operating efficiency during the selection.

[0106]

Also, it is possible to limit the program genre, so that only the images of programs associated with a particular program genre are displayed in multi-picture display mode. The user can first restrict the programs to a particular genre, and then select the desired program. As a result, program selection can be carried out more easily and efficiently.

Brief description of the figures

Figure 1 is a block diagram illustrating the constitution of the television receiver of the present invention.

Figure 2 is a block diagram illustrating the constitution of the multi-PIP processing part shown in Figure 1.

Figure 3 is a flow chart illustrating the flow chart for the microcomputer in Figure 1.

Figure 4 is a diagram illustrating the state in which the screen is divided into two halves, a main screen and a secondary screen for reduced images for search channel tuning in Embodiment 1.

Figure 5 is a flow chart illustrating Embodiment 2 of the process flow of the microcomputer shown in Figure 1.

Figure 6 is a diagram illustrating the state in which the screen is divided into two halves, a main screen and a secondary screen for reduced images for search channel tuning in Embodiment 2.

Figure 7 is a flow chart illustrating Embodiment 3 of the process flow of the microcomputer of Figure 1.

Figure 8 is a diagram illustrating the state in which the screen is divided into two halves, a main screen and a secondary screen for reduced images of the selected program genre in Embodiment 3.

Figure 9 is a flow chart illustrating Embodiment 4 of the process flow of the microcomputer in Figure 1.

Figure 10 is a diagram illustrating the state in which only the multiple images are displayed on the display device in Figure 1.

Figure 11 is a block diagram illustrating Embodiment 5 of the television receiver of the present invention.

Figure 12 is a block diagram illustrating Embodiment 6 of the television receiver of the present invention.

Figure 13 is a block diagram illustrating Embodiment 7 of the television receiver of the present invention.

Figure 14 is a block diagram illustrating Embodiment 8 of the television receiver of the present invention.

Explanation of symbols

18   Second tuner/IF detector (tuner)

20   Multi-PIP processor (compression/synthesis means)

21   Data extraction part

22	Microcomputer (data decoding, comparison of program genre, compression control, tuning control, storage means)

22   Microcomputer (data decoding, comparison of program genre, compression control,
       tuning control, storage means)

23   Character generator

24   Operation part (selection means)

26   Display processor

27   Display device

32   Tuner

33   Video signal processor

34   Compression/synthesis means

35   Data extraction means

36   Decoding means

37   Display processing means

38   Display device

39, 40 Selection means

41   Comparison means

42, 44 Control means

43   Storage means

100   Multi-image generating means

200   Decoding means
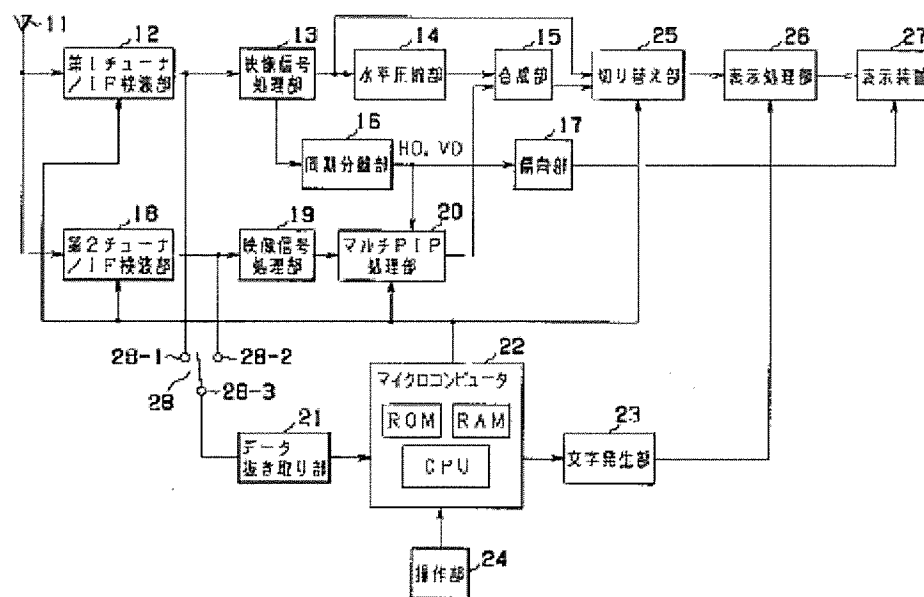
Figure 1

Key: 12   First tuner/IF detector
       13   Video signal processor
       14   Horizontal compression part
       15   Synthesis part
       16   Synchronization separation part
       17   Deflection part
       18   Second tuner/IF detector
       19   Video signal processor
       20   Multi-PIP processor
       21   Data extraction part
       22   Microcomputer
       23   Character generator
       24   Operation part (selection means)
       25   Switch part
       26   Display processor
       27   Display device
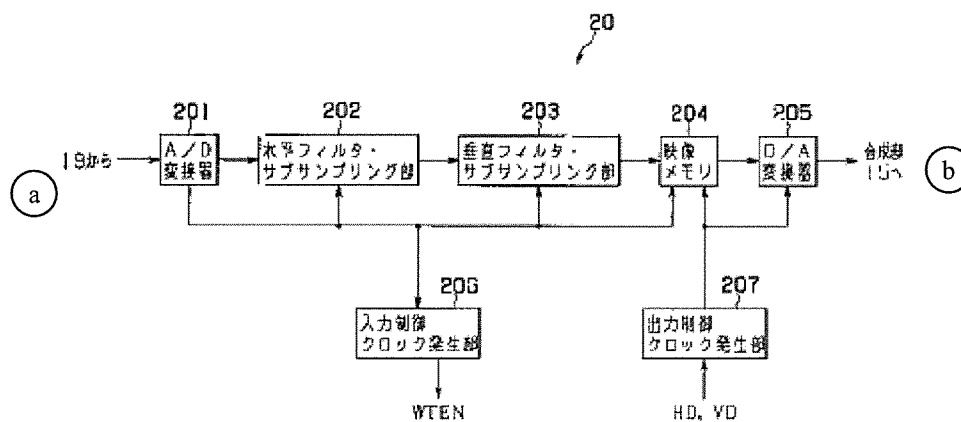
Figure 2

Key: a   From (19)
       b   To synthesis part [illegible]
       201   A/D converter
       202   Horizontal filter sub-sampling part
       203   Vertical filter sub-sampling part
       204   Video memory
       205   D/A converter
       206   Input control clock generator
       207   Output control clock generator
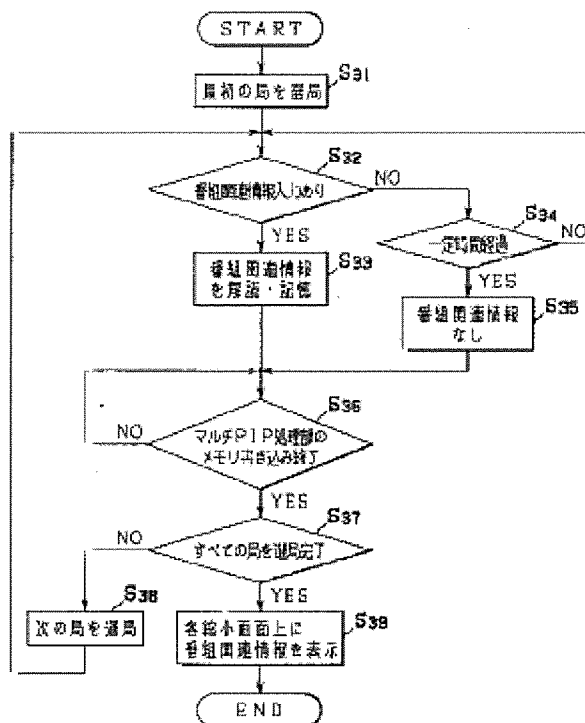
Figure 3

Key: S31   Tuning to the initial station
      S32   Has program-related information been input?
      S33   Decoding and storage of program-related information
      S34   Has prescribed time elapsed?
      S35   No program-related information
      S36   End of write to multi-PIP processor memory?
      S37   End of tuning for all stations?
      S38   Tuning in next station
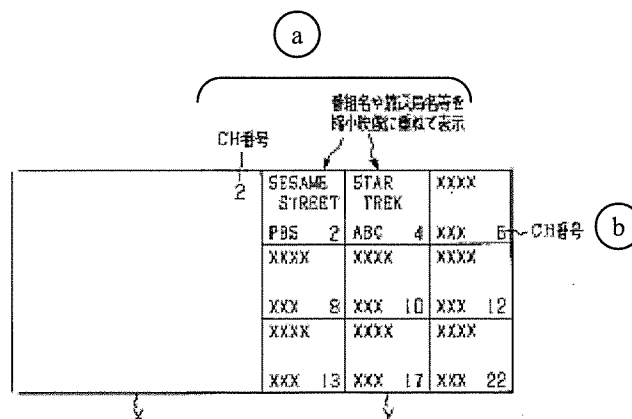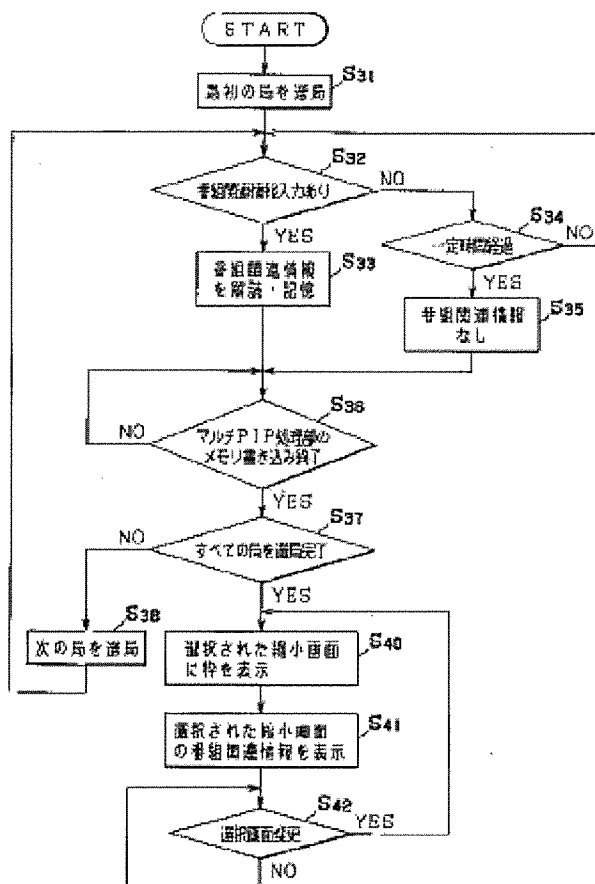   S39   Display of program-related information for each reduced image

Figure 4

Key: a   CH No.

Program title, broadcasting station name, and other information superimposed on
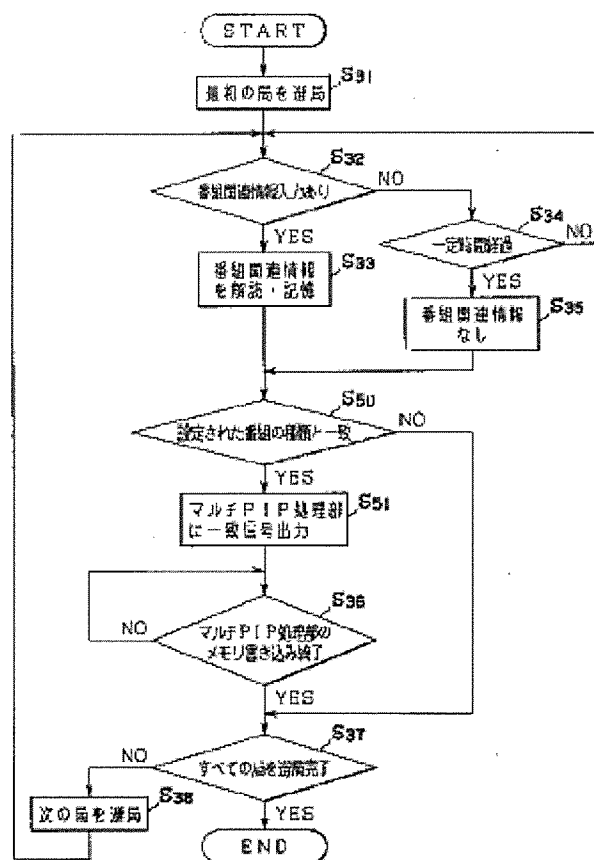the reduced images
b   CH No.

Figure 5

Key: S31   Tuning to the initial station
      S32   Has program-related information been input?
      S33   Decoding and storage of program-related information
      S34   Has a prescribed time elapsed?
      S35   No program-related information
      S36   End of write to multi-PIP processor memory?
      S37   End of tuning for all stations?
      S38   Tuning in next station
      S40   Display of frame around selected reduced image
      S41   Display of program-related information of the selected reduced image
      S42   Change selected image?
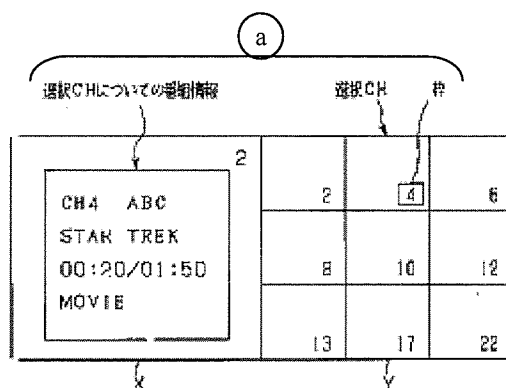
Figure 6

Key: a   Program information for which main picture channel
          Channel No.
          No.

Figure 7

Key: S31   Tuning to initial station
     S32   Has program-related information been input?
     S33   Decoding and storage of program-related information
     S34   Has prescribed time elapsed?

S38   Tuning in next station
S60   Read program-related information for the prescribed station from RAM
S61   Agreement with the selected program genre?
S62   Tuning in station

SESAME STREET		STAR TREK		X X X X	
PDS	2	ABC	4	XXX	6
X X X X		X X X X		X X X X	
XXX	8	XXX	10	XXX	12
X X X X		X X X X		X X X X	
XXX	13	XXX	17	XXX	22

Figure 10

Figure 11
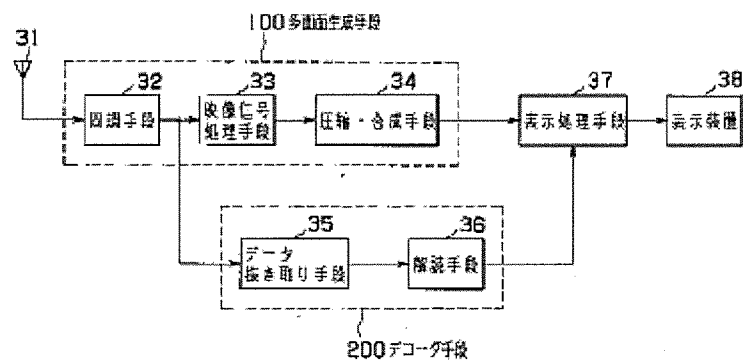
Key: 32   Tuner
        33   Video signal processor
        34   Compression/synthesis means
        35   Data extraction means
        36   Decoding means
        37   Display processing means
        38   Display device
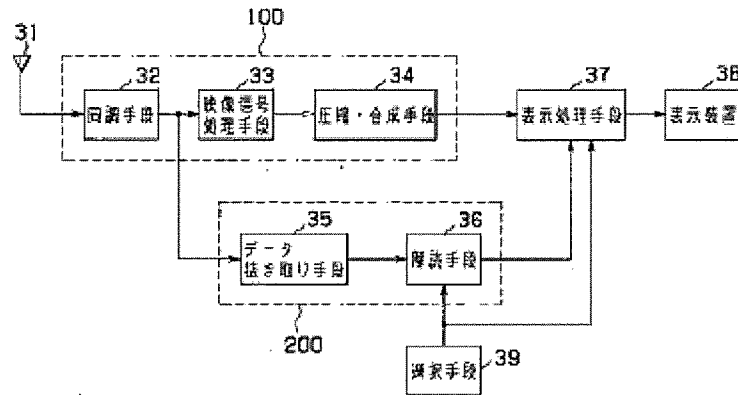   100   Multi-image generating means
      200   Decoding means

Figure 12

Key:
	32	Tuner
	33	Video signal processor
	34	Compression/synthesis means
	35	Data extraction means
	36	Decoding means
	37	Display processing means
	38	Display device
	39	Selection means

Figure 13

Key:
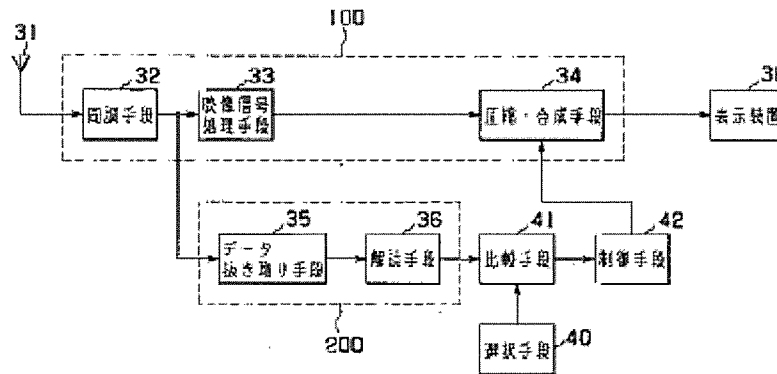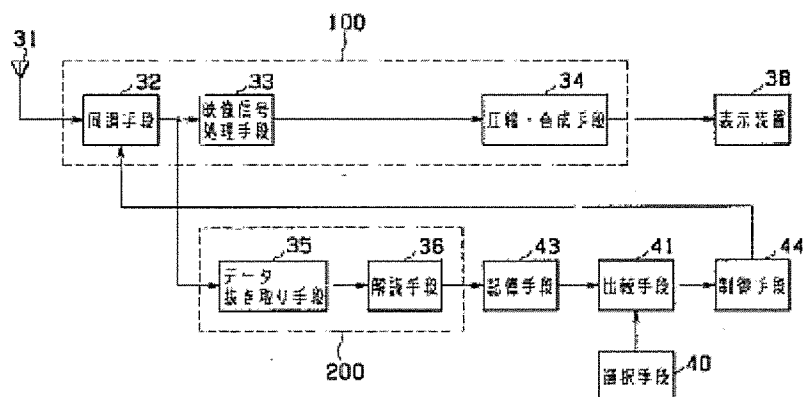|	32	Tuner
	33	Video signal processor
	34	Compression/synthesis means
	35	Data extraction means
	36	Decoding means
	38	Display device
	40	Selection means
	41	Comparison means
	42	Control means

Figure 14

Key: 32   Tuner
33   Video signal processor
34   Compression/synthesis means
35   Data extraction means
36   Decoding means
38   Display device
40   Selection means
41   Comparison means
43   Storage means
44   Control means